

AMENDMENTS TO THE CLAIMS

Please cancel claims 1-18 without prejudice or disclaimer. A complete set of pending claims is shown below.

1-18. (Canceled)

19. (Original) A polishing apparatus comprising:

a polishing tool having a polishing surface and having conductivity;

a polishing tool rotating and holding means for rotating said polishing tool about a predetermined axis of rotation and holding the same;

a rotating and holding means for holding a polishing object and rotating the same about a predetermined axis of rotation;

a movement and positioning means for moving and positioning said polishing tool to a target position in a direction facing said polishing object;

a relative moving means for making the polished surface of said polishing object and the polishing surface of said polishing tool relatively move along a predetermined plane;

an electrolyte feeding means for feeding an electrolyte onto the polished surface of said polishing object; and

an electrolytic current supplying means for supplying an electrolytic current flowing through said polishing tool through said electrolyte from said polished surface by using the polished surface of said polishing object as an anode and said polishing tool as a cathode.

20. (Original) A polishing apparatus as set forth in claim 19, further comprising a polishing agent feeding means for feeding a chemical polishing agent including a polishing abrasive on to the polished surface of the polished object.

21. (Original) A polishing apparatus as set forth in claim 19, wherein said electrolytic current supplying means comprises:

a current supplying means arranged to be able to be brought into contact or proximity with the polished surface of said polished object and supply current to the polished surface using the polished surface of the polished object as an anode, and

a DC power supply supplying a predetermined DC power between said current supplying means and said polishing tool.

22. (Original) A polishing apparatus as set forth in claim 21, wherein said DC power supply outputs a pulse-like voltage of a predetermined period.

23. (Original) A polishing apparatus as set forth in claim 21, wherein said polishing tool comprises a wheel-shaped conductive member and one annular end face of said member comprises a polishing surface, and

said current supplying means comprises a conductive electrode plate provided at the inside of the polishing tool away from the polishing tool, held by said rotation and holding means, and rotated along with said polishing tool.

24. (Original) A polishing apparatus as set forth in claim 23, wherein said electrode plate comprises a scrub member having a surface for scrubbing the polished surface at the side facing the polished surface of the polished object.

25. (Original) A polishing apparatus as set forth in claim 24, wherein said scrub member is formed from a material which absorbs the electrolyte and the chemical polishing agent including the polishing abrasive and able to supply a current and supplies the electrolyte and/or chemical polishing agent supplied from said electrode plate side to the polished surface of said polished object.

26. (Original) A polishing apparatus as set forth in claim 21, wherein said polishing tool is held by a conductive member connected with said rotation and holding means and is supplied with current through a conductive brush contacting said rotating conductive member.

27. (Original) A polishing apparatus as set forth in claim 23, wherein said electrode plate comprises a metal more precious than the electrolyzed metal formed on the polished surface of the polished object.

28. (Original) A polishing apparatus as set forth in claim 19, further comprising a current detecting means for detecting a value of an electrolytic current flowing from the polished surface of said polished object to said polishing tool.

29. (Original) A polishing apparatus as set forth in claim 23, further comprising a resistance value detecting means for detecting an electrical resistance between said electrode plate and said polishing tool through the polished surface of said polished object.

30. (Original) A polishing apparatus as set forth in claim 29, further comprising a control means for controlling a position of a facing direction of said polishing tool and said polished object so that the value of the electrolytic current becomes constant based on a detection signal of said current detecting means.

31. (Original) A polishing apparatus which comprises a polishing tool having a polishing surface which contacts the entire surface of the polished surface of the polishing object while rotating and which brings said polishing object into contact with said polished surface while rotating it so as to flatten and polish the same, said polishing apparatus comprising:

an electrolyte feeding means for feeding an electrolyte onto said polishing surface, and

an anode electrode and a cathode electrode capable of supplying electric power to the polished surface of said polishing object in said polishing surface,

said polishing apparatus flattening and polishing flattens and polishes the polished surface of said polishing object by electrolytic composite polishing which combines electrolytic polishing by said electrolyte and mechanical polishing by said polishing surface.

32. (Original) A polishing apparatus as set forth in claim 31, further comprising a polishing agent feeding means for feeding a chemical polishing agent including a polishing abrasive to the polishing surface, and

said polishing apparatus flattening and polishing the polished surface of the polished object by electrolytic composite polishing combining electrolytic polishing by said electrolyte and chemical mechanical polishing by said polishing surface and said polishing agent.

33. (Original) A polishing method including the steps of:
pushing the polishing surface of a conductive polishing tool and the surface of the polishing object with a metal film formed on at least the surface or an inner layer against each other while interposing the electrolyte therebetween;

supplying the electrolytic current flowing from the surface of said polishing object to said polishing tool through said electrolyte by using said polishing tool as a cathode and the surface of said polishing object as an anode,

making said polishing tool and said polishing object move relatively along a predetermined plane while rotating the two; and

flattening the metal film formed on said polishing object by electrolytic composite polishing combining electrolytic polishing by the electrolyte and mechanical polishing by the polishing surface.

34. (Original) A polishing method as set forth in claim 33, further including the step of interposing a chemical polishing agent containing a polishing abrasive together with said electrolyte between the polishing surface and the surface of the polished object and flattening the metal film formed on the polished object by electrolytic composite polishing combining electrolytic polishing by said electrolyte and chemical mechanical polishing by said polishing surface and said polishing agent.

35. (Original) A polishing method as set forth in claim 33, wherein said polished object comprises a stack of a plurality of films comprised of different materials, and

the current flowing from the surface of the polished object to the polishing tool through the electrolyte, changing in response to differences in the

electrical characteristics of the materials of the films, is monitored and the progress in the polishing is managed based on the magnitude of the electrolytic current.

36. (Original) A polishing method as set forth in claim 33, further including the step of supplying a pulse-like voltage of a predetermined period between the polishing tool and the surface of the polished object to supply said electrolytic current.

37. (Original) A polishing method as set forth in claim 33, further including the step of bringing an electrode member into proximity or contact with the surface of the polished object supplied with the electrolyte to supply current to the surface of the polished object.

38. (Original) A polishing method as set forth in claim 37, further including the step of supplying current to the metal film formed on said polished object while making said electrode member rotate along with said polishing tool and making it move relatively with respect to the polished object.

39. (Original) A polishing method as set forth in claim 37, further including the step of managing the progress of the polishing of the polished object based on the magnitude of the electrical resistance between said electrode member and said polishing tool through the surface of the polished object.

40. (Original) A polishing method as set forth in claim 34, further including the step of positively charging the polishing abrasive contained in the polishing agent.

41. (Original) A polishing method including the steps of:

forming a passivation film exhibiting a function of preventing an electrolytic reaction of the metal film at the surface of the metal film formed on the polishing object;

pushing the polishing surface of a conductive polishing tool and a metal film against each other while interposing an electrolyte between the polishing surface and the metal film, and then applying a predetermined voltage between said polishing tool and said metal film;

making the polishing surface of said polishing tool and the metal film of said polishing object move relatively along a predetermined plane and selectively removing a passivation film on a projecting portion projected from the polishing surface of said polishing tool in said metal film by mechanical polishing by said polishing tool; and

removing a projecting portion of the metal film exposed at the surface due to the removal of said passivation film by the electrolytic polishing function by said electrolyte and flattening said metal film.

42. (Original) A polishing method as set forth in claim 41, further including the step of interposing a chemical polishing agent containing a polishing abrasive together with said electrolyte between the polishing surface and the metal film and selectively removing the passivation film by chemical mechanical polishing by said polishing surface and said polishing agent.

43. (Original) A polishing method as set forth in claim 41, wherein said passivation film comprises of an oxide film formed by oxidizing the surface of said metal film.

44. (Original) A polishing method as set forth in claim 41, wherein said passivation film forms a film comprised of a material exhibiting an action of inhibiting an electrolytic reaction of the metal comprising said metal film on the surface of said metal film.

45. (Original) A polishing method as set forth in claim 41, wherein said passivation film is higher in electrical resistance and lower in mechanical strength compared with the metal film.

46. (Original) A polishing method as set forth in claim 41, further including the step of bringing an electrode member into proximity or contact with the surface of the metal film to supply current to the surface of the metal film.

47. (Original) A polishing method as set forth in claim 46, further including the step of managing the progress of the polishing based on the magnitude of the electrical resistance between said electrode member and said polishing tool.

48. (Original) A polishing method as set forth in claim 42, further including the step of positively charging the polishing abrasive contained in the polishing agent.